

Table 1. Summary of hypotheses, corresponding specific predictions, and results.

| Hypotheses & Specific Predictions | Prediction supported? | | | | Results |
|---|-----------------------|-------|-------|-------|-----------------------|
| | Overall | 1966 | 1977 | 1999 | |
| Tree size and microenvironment | | | | | |
| <i>Taller height makes trees less drought resistant.</i> Rt decreases with height (H). | yes | yes | (yes) | (yes) | Fig. 4; Tables S5, S7 |
| <i>Trees with more exposed crowns have lower drought resistance.</i> Accounting for H, dominant trees have lowest Rt. | (no)* | (no)* | (yes) | (no)* | Fig. 4; Tables S5, S7 |
| <i>Small trees (lower root volume) in drier microhabitats have lower drought resistance.</i> There is a negative interactive effect between H and topographic wetness index. | (no) | - | -* | (no)* | Tables S5, S7 |
| Species traits | | | | | |
| <i>Species' traits—particularly leaf hydraulic traits—predict drought resistance.</i> | | | | | |
| Wood density correlates (positively or negatively) to Rt. | - | - | - | - | Tables S4, S6 |
| Leaf mass per area correlates positively to Rt. | - | - | - | - | Tables S4, S6 |
| Ring-porous species have higher Rt than diffuse- or semi-ring- porous. | - | yes* | -** | yes | Tables S4, S6 |
| Percent loss leaf area upon desiccation correlates negatively with Rt. | yes | yes | (yes) | (yes) | Fig. 4; Tables S5, S7 |
| Water potential at turgor loss correlates negatively with Rt. | (yes) | - | (yes) | (yes) | Fig. 4; Tables S5, S7 |

Parentheses indicate that the prediction was supported by one but not all of the top full models (Table S6). Dash symbols indicate that the response was not significant (Table S4)/ not represented in any of the top full models (Table S6). Asterisks indicate that the Rt_{ARIMA} models (Table S5, S7) yielded a different result: * Rt_{ARIMA} had a difference in significance/ inclusion in top full models. ** Rt_{ARIMA} model had a significant trend in the opposite direction of the Rt model (if significant) or the prediction (if no significant trend in Rt model).

Table 2. Summary of dependent and independent variables examined here, along with units, definitions, and sample sizes.

| variable | symbol | units | description | | category | n* |
|------------------------------|--------------|--------------------|--|--|---|-------------------------|
| Dependent variables | | | | | | |
| drought resistance | Rt | - | ratio of growth during drought year to mean growth of the 5 years prior. | | - | 1623 |
| | Rt_{ARIMA} | - | ratio of growth during drought year to growth predicted by ARIMA model. | | - | 1654 |
| Independent variables | | | | | | |
| drought year | Y | - | year of drought | | 1966 1977 1999 | 513 543 567 |
| <i>tree size</i> | | | | | | |
| diameter breast height | DBH | cm | DBH in drought year | | - | all |
| height | H | m | estimated H in drought year | | - | all |
| <i>microhabitat</i> | | | | | | |
| crown position | | - | 2018 crown position | | dominant (D) co-dominant (C) intermediate (I) suppressed (S) | 31 231 224 101 |
| topographic wetness index | TWI | - | steady-state wetness index based on slope and upstream contributing area | | - | all |
| <i>species' traits</i> | | | | | | |
| wood density | WD | g cm^{-3} | dry mass of a unit volume of fresh wood | | - | all |
| leaf mass per area | LMA | kg m^{-2} | ratio of leaf dry mass to fresh leaf area | | - | all |
| xylem porosity | | - | vessel arrangement in xylem | | ring (R) semi-ring (SR) diffuse (D) | 408 31 178 |
| turgor loss point | π_{tlp} | MPa | water potential at which leaves wilt | | - | all |
| percent loss area | PLA_{dry} | % | percent loss of leaf area upon dessication | | - | all |

*Sample sizes are prior to removal of outliers. Prior to analysis, we discarded # records with $Rt > 2$ and # records with $Rt_{ARIMA} > 2$.

Table 3. Overview of analyzed species, listed in order of their relative contributions to woody stem productivity ($ANPP_{stem}$) in the plot, along with numbers and sizes sampled, and species traits. Variable abbreviations are as in Table 2.

| species | % $ANPP_{stem}$ | n trees | DBH (cm) | | species traits (mean +/- sd) | | | | |
|--------------------------------|-----------------|---------|----------|--------------|------------------------------|------------------------|----------------|-------------------|------------------|
| | | | mean | range | WD ($g\ cm^{-3}$) | LMA ($g\ cm^{-2}$) | xylem porosity | π_{tlp} (Mpa) | PLA (%) |
| Liriodendron tulipifera (LITU) | 47.1 | 98 | 368.54 | 100 - 1004 | 0.4 ± 0.03 | 46.92 ± 12.38 | diffuse | -1.92 ± 0.17 | 19.56 ± 2.06 |
| Quercus alba (QUAL) | 10.7 | 61 | 471.51 | 114 - 791 | 0.61 ± 0.02 | 75.8 ± 11.05 | ring | -2.58 ± 0.08 | 8.52 ± 0.37 |
| Quercus rubra (QURU) | 10.1 | 69 | 548.79 | 110.7 - 1480 | 0.62 ± 0.02 | 71.13 ± 6.70 | ring | -2.64 ± 0.28 | 11.01 ± 0.84 |
| Quercus velutina (QUVE) | 7.8 | 77 | 541.38 | 160.2 - 1142 | 0.65 ± 0.04 | 48.69 ± 3.30 | ring | -2.39 ± 0.15 | 13.42 ± 0.84 |
| Quercus montana (QUPR) | 4.8 | 59 | 422.48 | 105 - 872 | 0.61 ± 0.01 | 71.77 ± 40.17 | ring | -2.36 ± 0.09 | 11.75 ± 1.37 |
| Fraxinus americana (FRAM) | 3.8 | 62 | 353.63 | 64 - 947.3 | 0.56 ± 0.01 | 43.28 ± 4.78 | ring | -2.1 ± 0.36 | 13.06 ± 1.06 |
| Carya glabra (CAGL) | 3.7 | 31 | 313.89 | 98 - 985 | 0.62 ± 0.04 | 42.76 ± 0.94 | ring | -2.13 ± 0.50 | 21.09 ± 5.48 |
| Juglans nigra (JUNI) | 2.1 | 31 | 481.42 | 242 - 870 | 1.09 ± 0.09 | 72.13 ± 7.10 | semi-ring* | -2.76 ± 0.21 | 24.64 ± 8.72 |
| Carya cordiformis (CACO) | 2.0 | 13 | 271.87 | 107 - 615 | 0.83 ± 0.10 | 45.86 ± 15.60 | ring | -2.13 ± 0.45 | 17.22 ± 2.25 |
| Carya tomentosa (CATO) | 2.0 | 13 | 209.74 | 121 - 322.1 | 0.83 | 45.36 | ring | -2.2 | 16.56 |
| Fagus grandifolia (FAGR) | 1.5 | 80 | 235.11 | 112 - 1072 | 0.62 ± 0.03 | 30.68 ± 4.94 | diffuse | -2.57 | 9.45 ± 1.25 |
| Carya ovalis (CAOVL) | 1.1 | 23 | 352.87 | 149 - 660 | 0.96 ± 0.33 | 47.6 ± 3.95 | ring | -2.48 ± 0.04 | 14.8 ± 6.34 |

* Semi-ring porosity is intermediate between ring and diffuse. We group it with diffuse-porous species for more even division of species between categories.

Figure Legends

Figure 1. Climate and species-level growth responses over our study period, highlighting the three focal droughts (a) and community-wide responses Time series plot (a) shows peak growing season (May-August) climate conditions and residual chronologies for each species (see Table 3 for codes). PET and PRE data were obtained from the Climatic Research Unit high-resolution gridded dataset (CRU TS v.4.01; Harris et al. 2014). Focal droughts are indicated by dashed lines, and shading indicates the pre-drought period used in calculations of the resistance metric. Figure modified from Helcoski *et al.* (2019). Density plots (b) show the distribution of resistance values for each drought.

Figure 2. Drought resistance, R_t , across species for the three focal droughts. Drought are color coded as in Fig. 1. Species codes are given in Table 3.

Figure 3. Height profiles in growing season climatic conditions and tree heights by crown position Shown are averages (\pm SD) of daily maxima and minima of (a) wind speed, (b) relative humidity (RH), and (c) air temperature (T_{air}) averaged over each month of the peak growing season (May-August) from 2016-2018. In these plots, heights are slightly offset for visualization purposes. Also shown is (d) 2018 tree heights by canopy position (see Table 2 for codes). In all plots, the dashed horizontal line indicates the 95th percentile of tree heights in the ForestGEO plot.

Figure 4. ...



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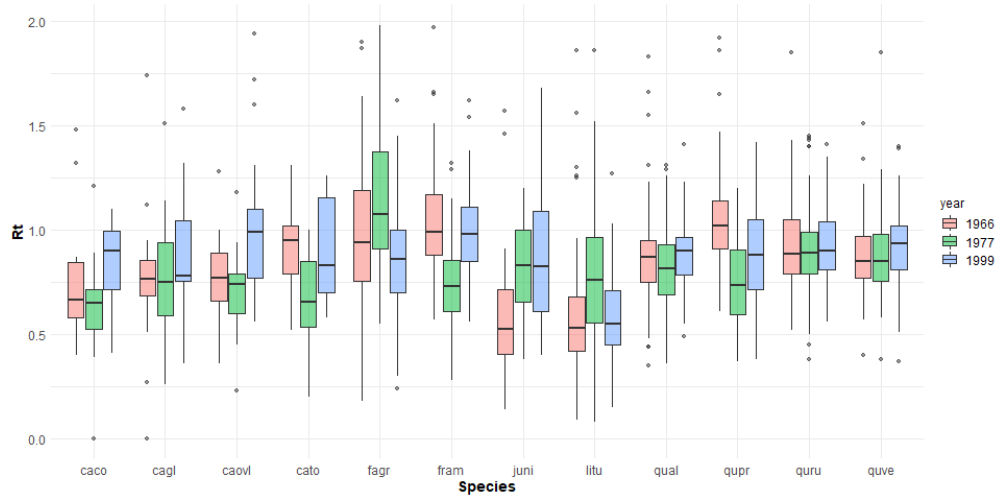


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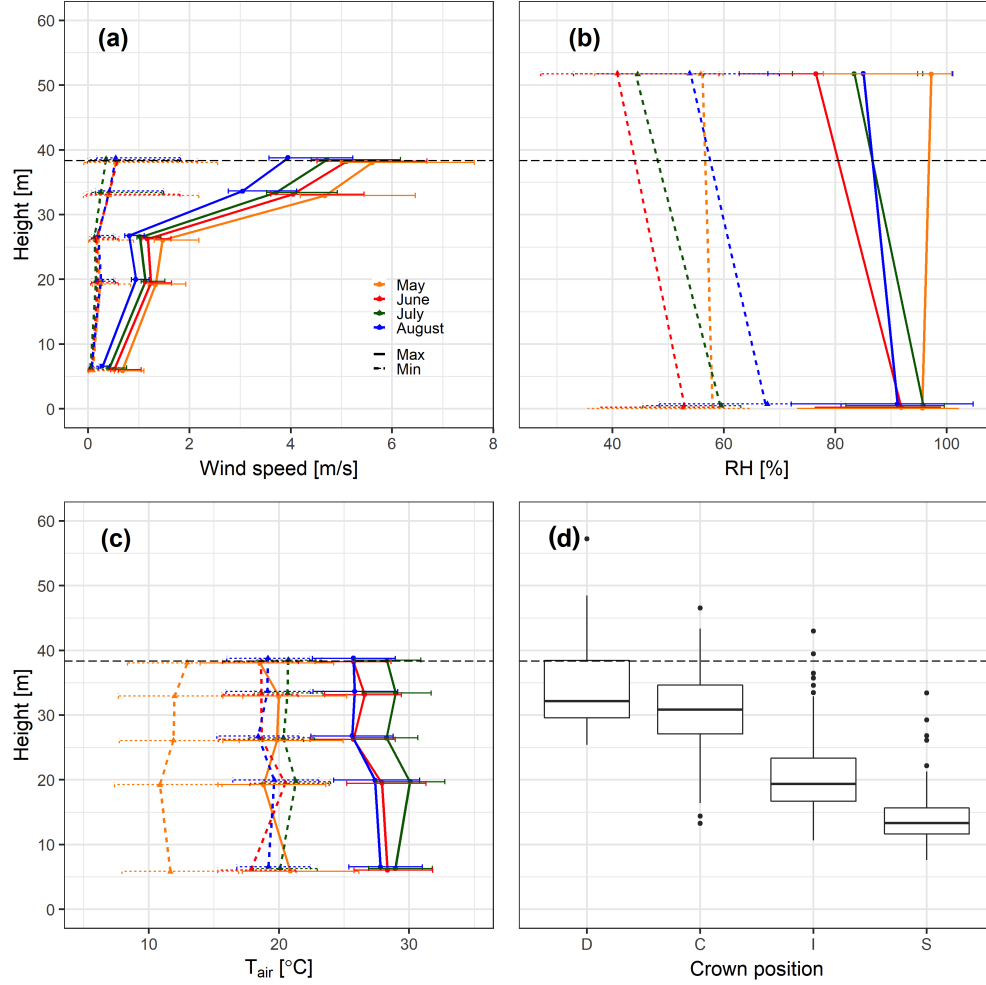


Figure 3. Height profiles in growing season climatic conditions and tree heights by crown position The top row shows averages (\pm SD) of daily maxima and minima of (a) wind speed, (b) relative humidity (RH), and (c) air temperature (T_{air}) averaged over each month of the peak growing season (May-August) from 2016-2018. In these plots, heights are slightly offset for visualization purposes. Also shown is (d) 2018 tree heights by canopy position (see Table 2 for codes). In all plots, the dashed horizontal line indicates the 95th percentile of tree heights in the ForestGEO plot.

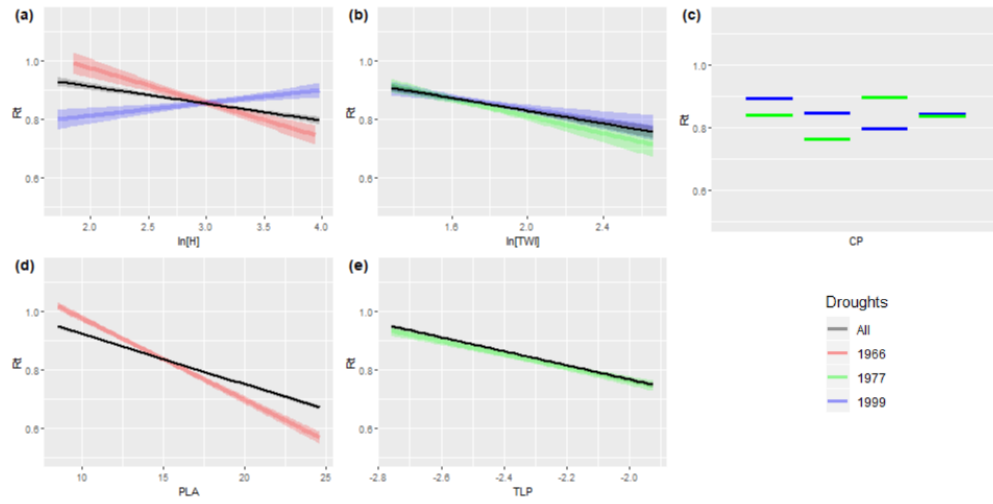


Figure 4. Visualization of top models for all droughts combined and for each drought separately. Model coefficients are given in Table S6. **THIS IS NOT YET CORRECT** (having trouble making gg-plot work. **THE POSITIVE HEIGHT EFFECT FOR 1999 IS WRONG. FINAL FIG WILL MATCH MODELS IN TABLE S6.**